



Original Article

Study Of Bacteriological Profile and Their Antibiotic Sensitivity Pattern in Catheter Associated Urinary Tract Infection in Patients at Tertiary Care Hospital

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ABSTRACT

Introduction: Antimicrobial Resistance and Hospital Acquired Infections are the modern hazards in the field of medicine. The aim of the present study was to identify uro-pathogens causing UTI in patients with indwelling catheter and to assess their antibiotic susceptibility profile in a tertiary care hospital.

Materials and Methods: The present study is a hospital-based cross-sectional study done in a tertiary care hospital. The study was done for a period of January 2021 to June 2022 and included 256 patients who were admitted in ICU and ward requiring urinary catheterization. Under aseptic conditions urine samples were collected and processed in the department of Microbiology, as per standard protocols. Bacterial identification and antibiotic susceptibility testing were done by conventional bacteriological techniques.

Result: A total of 256 patients undergoing catheterization were evaluated for UTI. Culture positivity rate is marginally higher in females (36.71%) compared to males (21.87%). Culture positivity was observed in 150 (58.58%) and 106 (41.42%) were culture negative. The results of the study revealed that the most common isolate causing CAUTI in the hospital was *Escherichia coli*, followed by *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Enterococci* and *Pseudomonas aeruginosa*. Among culture positive cases, Gram negative isolate was more predominant (68.67%) and Gram positive were (30.67%) and *Candida* (0.66%). Isolated gram-negative organisms show most sensitive to Piperacillin-tazobactam, Amikacin. Gram positive isolates were highly sensitive to Linezolid.

Discussion and Conclusion: CAUTI remained a great burden to patient safety and a challenge to the infection control team. Unnecessary urethral catheterization should be avoided to reduce catheter-related complications. Urinary tract infections are the most common nosocomial infections, comprising about 35%. Adherence to infection control program and proper enforcement and periodic review of antibiotic policy well definitely reduces CAUTI thereby decreasing patient morbidity.

Keywords: Hospital Acquired Infections, Catheter Associated Urinary Tract Infections, Antibiotic Sensitivity Pattern, Uropathogens, Nosocomial infection.

INTRODUCTION

Urinary tract infection (UTI) is a spectrum of disease caused by microbial invasion of the genitourinary tract that extends from renal cortex of the kidney to the urethral meatus¹. Urinary tract infections (UTI) are among the most common bacterial infections, and affect about 150 million individuals annually worldwide.² Catheter-acquired urinary tract infection is one

of the most common healthcare acquired infections; It has been estimated that about 10% of hospitalized patients require urinary catheterization.³

For an infection to be classified as a CAUTI under guidelines published by the US Centers for Disease Control and Prevention (CDC), a patient must have:

- (a) Had an indwelling urinary catheter for more than 2 days by the date of event,
- (b) One sign or symptom including fever, suprapubic tenderness, costovertebral angle tenderness, urinary frequency or urgency or dysuria; and
- (c) Urine culture with more than 10^5 CFU/mL of one bacterial species (non- bacterial pathogens have been excluded since 2015).⁴

The duration of catheterization is directly related to the development of infection. Bacteria can easily invade the lower urinary tract along the external surface of the catheter or by ascending route through the lumen of the catheter.⁵ Risk factors associated with development of CAUTI include prolonged catheterization, lengthy hospital stay, female gender and co-morbid conditions.⁶ CAUTI can lead to complications such as prostatitis, epididymitis, and orchitis in males, and cystitis, pyelonephritis, gram-negative bacteremia, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis.⁷ High recurrence rates and increasing antimicrobial resistance among uropathogens threaten to greatly increase the economic burden of these infections.⁸

Hence, this study was undertaken to know the microbial profile and antibiotic sensitivity pattern in patients suffering from Urinary Tract Infection.

Objectives

1. To isolate the organisms causing CAUTI
2. To study the antibiotic pattern sensitivity pattern of the isolates causing CAUTI.

MATERIALS AND METHOD

Type of study - It was a hospital based cross sectional study.

Study Duration: From January 2021 to June 2022

Sample size: 256 patients (catheterised urine samples)

Study Site and Population: A hospital-based study survey among All clinically suspected cases of urinary tract infection in catheterized patients above 18 years of age admitted in wards and ICUs.

Inclusion Criteria:

1. All patients catheterized for more than 48hrs at the time of specimen collection, admitted in wards and ICUs.
2. Patients of age more than 18years.
3. Both sexes included.

Exclusion Criteria

1. Pregnant women.
2. Patients less than 18years of age.
3. Patients on antimicrobial therapy for UTI.

Procedure methodology:

Urine samples were collected from clinically suspected cases of CAUTI in a sterile wide mouthed universal container taking aseptic precautions with a sterile disposable syringe after cleaning and clamping the catheter tube or port of Foley's catheter⁹. Macroscopic and Microscopic examination of urine was done.

Wet mount was prepared for microscopic examination using uncentrifuged samples, to note the number of pus cells, epithelial cells, RBCs and microorganisms in high-power magnification.¹⁰ Urine samples were subjected to cultures and complete bacteriological identification done according to standard operating procedures. The samples were then inoculated semi quantitatively on 5% sheep blood agar, Cystine Lactose Electrolyte Deficient (CLED) agar, MacConkey agar and incubated overnight at 37°C aerobically.¹⁰ After overnight incubation, colony count of the growth was performed to confirm its significance according to the Kass Concept of Significant Bacteriuria. The urine cultures of colony count $>10^5$ colony forming units (CFU)/ML with no more than two species of microorganisms were considered as positive for CAUTI and cultures showing growth of more than two types of bacteria were considered contaminated. The plates with significant colony count were further processed based on colony morphology, Gram staining and standard biochemical tests for species level identification of bacteria were done. Antibiotic susceptibility testing was performed by Kirby-Bauer's disk diffusion method on Mueller-Hinton agar as per the CLSI guidelines.¹¹

RESULTS AND OBSERVATIONS-

The incidence of CAUTI in our study was found to be 58.58%.

A total of 256 samples were included in the study among which 160 were females and 96 were males below are the results and observations of the study undertaken-

Table No.1- Gender Distribution

Gender	Percentage
Female	63 %
Male	37 %

In our study the majority of the samples were collected from female patients (63%), the rest 37% of the urine samples were from males.

Table No.2-Symptoms in Patients

Symptoms	Frequency (n)
Fever	143
Dysuria	124
Urgency	87
Abdominal pain	46
Oliguria	12

Fever (143) and Dysuria (124) were the most common symptom associated with the infected patients. The least common symptom encountered was oliguria seen in 12 patients.

Table No.3 Day wise analysis

DAY 3	3%
DAY 7	8%
DAY 14	18%
DAY 21	35%
DAY 28	55%

The CAUTI cases were detected from 3rd day of catheterization onwards and increased with the duration of catheterization. The more the number of days of catheterization the more the chances of CAUTI. The relation between the days of catheterization and CAUTI was found to be directly proportional.

Table No.4- Isolates Analysis

Isolates	Percentage %
Gram Negative	68.67
Gram Positive	30.67
Candida	0.66

The result of this study shows, majority of isolates were Gram negative isolates 103(68.67%), followed by Gram positive bacteria 46(30.67%) and followed by other like Candida 1(0.66%) among suspected cases of CAUT

Table No.5- Isolates

Isolates	Percentage
E.Coli	25.33
Klebsiella spp	20.00
Enterococci spp	14.66
Staphylococcus aureus	16.00
Candida spp	0.66
Pseudomonas spp	5.33
Acinetobactor spp	6.66
Proteus spp	5.33
Citrobactor spp	6.00

Majority of the isolates were E. coli 38 (25.33%) followed by Klebsiella. spp 30(20.00%), Enterococci spp. 22(14.66%), Staphylococcus aureus 24(16.00%), Candida spp 1(0.66%), Pseudomonas spp.8(5.33%).

Table No.6-Antibiotic sensitivity pattern of Staphylococcus aureus

	Sensitive	Percentage	Resistant	Percentage %
Cefoxitin	15	62.50%	9	37.50%

Gentamicin	16	66.67%	8	33.33%
Co-trimoxazole	14	58.33%	10	41.67%
Penicillin	11	45.83%	13	54.17%
Clindamycin	22	91.67%	2	8.33%
Linezolid	24	100.00%	0	0%
Teichoplanin	24	100.00%	0	0%
Ciprofloxacin	13	54.17%	11	45.83%

In our study Staphylococcus aureus were 100% sensitive to Linezolid and Teichoplanin , 92% sensitive Clindamycin and 54% resistance to Penicillin and 45% resistance to Ciprofloxacin

Table No.7-Antibiotic sensitivity pattern of Enterococcus

	Sensitive	Percentage	Resistant	Percentage
Penicillin	2	9.09%	20	90.91%
Gentamicin	17	77.27%	5	22.73%
Ciprofloxacin	11	50.00%	11	50.00%
Teicoplanin	22	100.00%	0	0%
Linezolid	22	100.00%	0	0%

Table Shows Enterococcus were 100% sensitive to Linezolid, Teichoplanin and 77% sensitive to Gentamycin. 90% of the organisms were resistant to Penicillin

Table No.8-Antibiotic sensitivity pattern of E. coli

	Sensitive	Percentage	Resistant	Percentage
Amikacin	35	92.10.%	3	7.89%
Gentamicin	24	63.15%	14	36.84%
Ciprofloxacin	18	47.36%	20	52.63%
Norfloxacin	18	47.36%	20	52.63%
Piperacillin	33	86.84%	5	13.15%
Piperacillin- tazobactam	38	100.00%	0	0.0%
Nitrofurantoin	38	100.00%	0	0.0%
Cotrimoxazole	15	39.47%	23	60.52%
Cefotaxime	20	52.63%	18	47.36%
Ceftazidime	26	68.42%	12	31.57%

In our study E. coli were 100% sensitive to Piperacillin tazobactam and Nitrofurantoin , 92% to Amikacin ,86.84% to Piperacillin. 60% of the organism were resistant to Cotrimoxazole, 52% were resistant to Ciprofloxacin.

Table No.9-Antibiotic sensitivity pattern of Klebsiella

	Sensitive	Percentage	Resistant	Percentage
Amikacin	26	86.67%	4	13.33%
Gentamicin	16	53.33%	14	46.67%
Ciprofloxacin	15	50.00%	15	50.00%
Norfloxacin	15	50.00%	15	50.00%
Piperacillin	23	76.67%	7	23.33%
Piperacillin- Tazobactam	30	100.00%	0	0.00%
Nitrofurantoin	30	100.00%	30	100.00%
Cotrimoxazole	12	40.00%	18	60.00%
Cefotaxime	10	33.33%	20	66.67%
Ceftazidime	16	53.33%	14	46.67%

Table shows Klebsiella were 100% sensitive to Piperacillin tazobactam, and Nitrofurantoin, 87% sensitive to Amikacin , 77% to Piperacillin. 67% of the organisms were resistant to Cefotaxime, 60% were resistant to Cotrimoxazole, 50% resistant to Ciprofloxacin.

DISCUSSION

Urinary tract infections is the most common nosocomial infections, comprising about 35% of such occurrences in both hospitals and nursing homes. The incidence of CAUTI in our study was found to be 58.58%. In a study conducted by Ramindar sandhu et al(2018)12 it was found to be 10.55%. In another study by Adithya acharya et al (2020) 13 it was found to be 62%. The incidence of CAUTI among males and females in our study was found to be 21.87% and 36.71% respectively. In a study conducted by thindiparembeth et al (2022)14, 17.3% males were positive for CAUTI while 31.9%

female developed infection. In a study conducted by sunil kumar d Chavan et al 15 males (17.7%) were affected more than females (5.5%).

In a study conducted by Jay Khullar et al (2022) 16 the most common organisms isolated were E.coli(52.00%).Enterococcus spp.(20.00%) Pseudomonas spp.(16.00%). Klebsiella pneumoniae (12.00%). Same results were reported by Aditya acharya et al(2020) 13, the common organisms isolated were E.coli (36.5%),Klebsiella. Spp (20.6%), Enterococci (11.1%), Pseudomonas spp. (9.5%), Acinetobacter (8.0%). Sandhu et al (2018) 12, study result shows the most common organisms isolated were E. coli 7 (41.18%), K. pneumoniae 1 (5.88%), Citrobacter freundii

The antibiotic sensitivity pattern of these different isolates was as follows-

In our study the common isolate E. coli (n=38). 100% sensitive to Piperacillin tazobactam and Nitrofurantoin 60% of the organism were resistant to Cotrimoxazole, 52% were resistant to Ciprofloxacin. Patil and Patil (2018) 17 Showed E coli were sensitive to Tigecycline, Colistin, Meropenem and Amikacin with significant resistance to Cephalosporin, PiperacillinTazobactam and Quinolone. In our study Staphylococcus aureus(n=24) were 100% sensitive to Linezolid and Teichoplanin,92% to Clindamycin. Sandhu et al (2018) 12 results show S.aureus were sensitive to Vancomycin (100.00%), followed by Linezolid (100.00%) and Amikacin (100.00%). In our study Klebsiella pneumoniae (n=30) was 100% sensitive to Piperacillin Tazobactam and Nitrofurantoin, 87% sensitive to Amikacin. In another study by Patil and Patil (2018) 17 K.pneumoniae were best sensitive to Colistin, Tigecycline, Meropenem, Imipenem, Aminoglycosides, this study findings are similar to our study findings.

CONCLUSION

In conclusion, the objective of this study was to determine the isolates causing CAUTI and their antibiogram in a tertiary care hospital.

The results of the study revealed that the most common isolate causing CAUTI in the hospital was Escherichia coli followed by Klebsiella pneumoniae, Staphylococcus aureus, enterococci and Pseudomonas aeruginosa. The study also found that the majority of the isolates were resistant to commonly used antibiotics such as Ampicillin and Ciprofloxacin.

The findings of this study have important implications for the management of CAUTI in the hospital setting. The high resistance rates to commonly used antibiotics also highlights the need for more effective and targeted antibiotic therapy in the management of CAUTI.

Overall, this study provides valuable information on the epidemiology of CAUTI in a tertiary care hospital and help to guide the development of more effective strategies for preventing and treating this condition.

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